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DIRECT TESTIMONY

OF

QIN LIU

POLICY DEPARTMENT

TELECOMMUNICATIONS DIVISION

ILLINOIS COMMERCE COMMISSION

ILLINOIS BELL TELEPHONE COMPANY

FILING TO INCREASE UNBUNDLED LOOP AND NONRECURRING RATES

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Table of Content

Introduction

Q. Please state you name and business address.

A. My name is Qin Liu, and my business address is 527 E Capitol Avenue, Springfield, Illinois 62701.

Q. Please describe your educational background.

A. I earned a BA in Mathematics in the People's Republic of China, and a PhD degree in economics from Northwestern University (Evanston) prior to joining the policy department of the Telecommunications Division at the Illinois Commerce Commission.

Q Have you previously testified before the Commission?

A. Yes. I have testified before this Commission in various proceedings, including ICC Dockets 00-0700, 01-0515, 01-0786, 01-0662, and 02-0560.

Overview

Q. Please describe the purpose of your testimony.

A. The main purpose of my testimony is to describe Staff's proposed changes to SBC's cost models and cost studies, and to explain how I implemented these changes in the various cost models and cost studies.

Q. Are you the Staff witness sponsoring these proposed changes?

A. No. My responsibility in this proceeding is limited to revising and updating various SBC's cost models and cost studies based on modifications proposed by other Staff witnesses – *i.e.*, implementing other Staff witnesses' modifications. Each respective Staff witness will sponsor these proposed changes. Similarly, my responsibility regarding the final recurring UNE loop rates is limited to generating these rates. Staff witness Peter Lazare (Ex. 3.0) sponsors the Staff proposed UNE loop rates in his testimony.

Q. Please briefly describe the various cost models and cost studies in which you implemented Staff's modifications in this proceeding.

A. The cost models and cost studies in which I implemented Staff's modifications include the following:

(1) *Loop Cost Analysis Tool* ("*LoopCAT")*:

Implement changes in the LoopCAT models and run the modified LoopCAT programs for the nine loop types (described below) and three rate zones (zone 1: urban, zone 2: suburban, and zone 3: rural),

(2) *Labor Rate Model*:

Update the labor rates that flow into LoopCAT by implementing the Staff's modifications to SBC's Assets Support factors in the three labor rate models *IL41XX00.xls*, *IL42XX00.xls* and *IL43XX00.xls*.

(3) *Premises Termination and Distribution Terminal Costs*:

Update the calculation of premises termination costs and distribution terminal costs by incorporating the modified labor rates into *Misc Material Cost 2002 (IL).xls*;[1]

(4) *Fiber Cable Cost Model*:

Update the calculation of fiber cable (*per foot*) costs by implementing Staff's *sales tax rate* and *fiber installation factors* in the fiber cable cost model *AIT Fiber Cost Summary 2002 (IL).xls*;

(5) *DS1 Circuit Equipment Investment Cost Model*:

Update the calculations of DS1 Circuit Equipment Investment costs by implementing Staff's proposed changes in the Circuit Equipment Investment models: *IL_2002_DS1 Loop Circuit Equipment (*).xls*;

(6) *DS3 Circuit Equipment Investment Cost Model*:

Update the calculations of DS3 Circuit Equipment Investment costs by implementing Staff's proposed changes in the Circuit Equipment Investment models: *IL_2002_DS3 Loop Circuit Equipment (*).xls*;

(7) *DS1 Recurring Loop Cost Study*:

Update the DS1 recurring loop cost study, which is part of the *Unbundled Loop TELRIC Recurring Cost Study;*

(8) *DS3 Recurring Loop Cost Study*:

[1] As discussed later in this testimony, Staff's proposed modifications in labor time also flow in to the calculation of Premises Termination costs and Distribution Terminal costs. The updating of

Update the DS3 recurring cost study *Unbundled DS3 Loop TELRIC Recurring Cost Study*; and

(9) *Unbundled Loop Recurring UNE Rates*:

Generate the thirty recurring UNE loop rates for the ten loop types and three rate zones (10 x 3) by applying Staff-proposed Shared & Common cost factor and Uncollectible factor to the TELRICs generated based on Staff's modifications.[2]

LoopCAT

Q. Please describe LoopCAT and its role in generating recurring UNE loop rates.

A. The LoopCAT cost model is designed by SBC to calculate the *monthly recurring costs* for the nine loop types (listed in Table 1 below) and three rate zones. Unlike previous loop cost models (such as AFAM[3]), which are mainframe-based, LoopCAT is a spreadsheet-based cost model. This makes the LoopCAT cost model relatively easy to understand, modify, and use.

premises termination and distribution terminal costs to reflect Staff's modifications in labor time is accomplished by Staff witness Peter Lazare (Ex. 3.0).

[2] Note that the recurring UNE rate for unbundled DS3 loop is developed in this proceeding, but it is done entirely outside of LoopCAT. I, consequently, only ran the LoopCAT program for nine loop types (three rate zones), although I calculated the recurring UNE rate for ten loop types (and three rate zones).

Table 1: LoopCAT Loop Types

Analog 2w basic	160 Kbps (ISDN-BRI)
Analog PBX Ground Start	1.544 Mbps (DS1)
Analog COPTS Coin	ADSL 2w / HDSL 2w
Analog EKL	ADSL 2w / HDSL 4w
Analog 4w	

These twenty-seven [9 (loop types) x 3 (rate zones)] monthly recurring loop costs (*i.e.*, outputs of LoopCAT) are fed into the *Unbundled Loop TELRIC Recurring Cost Study* to generate the Total Element Long Run Incremental Cost (TELRIC) for each loop type. The recurring UNE loop rate is *generally* the TELRIC with a Shared & Common cost markup:

$$UNE\ rate = (1 + S\&C\ factor)*TELRIC.$$

Due to different approaches to Shared & Common cost studies, however, costs that are recovered under SBC's proposal only through a Shared & Common cost markup, are recovered under Staff's proposal through a Shared & Common cost markup ***and*** an Uncollectible markup. That is, while SBC calculates its UNE rates according to the above formula, Staff calculates UNE rates as follows:

$$UNE\ rate = (1 + Uncollectible)*(1 + S\&C\ factor)*TELRIC.$$[4]

[3] AFAM refers to Ameritech Facilities Analysis Model.
[4] See Staff Ex. 8.0 (Patrick) and Staff Exhibit 9.0 (Smith) for detailed discussion of Staff's approach to Shared & Common cost study.

Q. Please list all the modifications that you implemented in LoopCAT.

A. The modifications that I implemented in LoopCAT and the respective Staff witnesses whose proposed input changes ultimately resulted in these modifications in LoopCAT are summarized In Table 2 below.

Table 2: Summary of the Modifications in LoopCAT

Input	*Staff Witness*
Sales Tax Rate	Peter Lazare (Ex. 3.0)
Capital and Expense Cost Factor	Bob Koch (Ex. 4.0) Mike McNally (Ex. 12.0) Pete Wagner (Ex. 13.0)
Crossover Length	Bob Koch (Ex. 4.0)
DLC - RT Common Investment	Bob Koch (Ex. 4.0)
DLC - RT EFI Factor	Peter Lazare (Ex. 3.0)
Copper Installation Factor	Peter Lazare (Ex. 3.0)
Fiber Cable Cost	Peter Lazare (Ex. 3.0)
Fill Factors	Bud Green (Ex. 10.0)
Residential/business Percentage	Jim Zolnierek (Ex. 7.0)
Premises Termination Cost	Peter Lazare (Ex. 3.0) Bob Koch (Ex. 4.0) Mike McNally (Ex. 12.0) Pete Wagner (Ex. 13.0)
Distribution Terminal Cost	Peter Lazare (Ex. 3.0) Bob Koch (Ex. 4.0) Mike McNally (Ex. 12.0) Pete Wagner (Ex. 13.0)

Each modification is described in detail below.

Q. Are all the modifications that you implemented in LoopCAT based on Staff's proposals?

A. No. One of the modifications that I implemented in LoopCAT is not based on a Staff proposal. Instead, it reflects the correction of an error made and acknowledged by SBC.

Q. Please explain.

A. In the LoopCAT runs submitted by SBC, fill factor for Feeder Distribution Interface ("FDI") is calculated as the weighted average of distribution cable fill factor and feeder cable fill factor, with distribution weight being 2/3 and feeder weight being 1/3. In response to Staff Data Request QL 1.03, SBC states that this is incorrect:

> After reviewing this issue, the use of the distribution fill for the distribution connections [on the FDI] is not correct. The correct methodology is to apply the feeder fill to all three connections. This change in methodology will accurately capture the cost for the FDI connections. [Illustration added][5]

That is, the feeder fill factor should be applied to FDI connections. I, accordingly, set the fill factor for FDI connections equal to the feeder fill factor by changing the formulas in D37:D38 in the FDI tab of LoopCAT.

As distribution fill factor is lower than feeder fill factor, this modification would lead to a higher FDI fill factor and thus lower fill-adjusted FDI

[5] See the attached Schedule 1.

investment cost, which in turn would lead to lower TELRIC and recurring UNE loop rate.

Q. Has SBC acknowledged any other errors made in its LoopCAT runs submitted in this proceeding?

A. Yes. In developing its premises termination costs (in LoopCAT), SBC applies the same set of installation factors and Annual Cost Factors ("ACFs") to both *aerial* and *buried* Building Entrance facilities (Intra-building wires/cables); *i.e*., SBC makes no distinction between aerial and buried cables. In response to Staff Data Request QL 1.06b, SBC faults its application of installation factors and ACFs to these Intra-building wires:

> However, based on additional research, we have determined that Building Entrance Facilities (Intra-building wire) should have been considered either aerial or buried in SBC Illinois. As a result, the aerial and buried loop installation factors and Annual Charge Factors (ACFs) should have been applied in the development of the Building Entrance Facilities.[6]

In other words, SBC should have applied aerial/buried copper cable installation factors and ACFs to aerial/buried building cables, respectively, as it has done for building terminals.

Q. Have you made any adjustment in LoopCAT to address SBC's misapplication of its installation factors or ACFs to Intra-building cable?

A. No. Intra-building cable investment is a small portion of the total loop investment, and is only, for *2w analog basic loop* - zone 1, xx cents compared to the total loop investment of $xxx.xx (*i.e.*, less than x.xxxx%).[7] The impact of adjusting Intra-building cable investment based on SBC's response to Staff Data Request QL 1.06b would be very small. Therefore, I have decided not to make any modification in LoopCAT to address the SBC-stated misapplication of installation factors as well as ACFs.

Q. Please describe Staff's proposed changes in the sales tax rate.

A. Staff witness Peter Lazare takes issues with SBC's proposed x.x% sales tax rate. He proposes to change this sales tax rate to 7.14%.

Sales tax rate flows into LoopCAT through two distinct channels: (1) directly and (2) indirectly through fiber cable (*per foot*) costs. Thus Staff's modification to sales tax rate is implemented in LoopCAT in two distinct ways. First, it is implemented by replacing the values in cells AF11 (equipment sales tax) and AJ11 (cable sales tax) in the *Yearly_Input* tab with the Staff's proposed sales tax rate of 7.14%.

Second, it is implemented by replacing the values in cells B48:D50 in the Yearly_Input tab of LoopCAT with the *updated* fiber cable (*per foot*) costs.

[6] See the attached Schedule 2.
[7] See Building Entrance Facility - Investment Per Loop and Total - Investment Per Loop in the Expanded Summary tab of LoopCAT for *2w analog basic loop* – zone 1.

The updating of the fiber cable (per foot) costs to reflect Staff's modification to sales tax rate is carried out in the fiber cable cost model *AIT Fiber Cost Summary 2002 (IL).xls* and will be described in detail later in this testimony along with Staff's modifications to SBC's fiber installation factors.[8]

Q. Please describe Staff's proposed changes to capital and expense cost factors.

A. The capital cost factors from CAPCS Tool and expense cost factors from ACF Tool are used to generate Annual Cost Factors ("ACFs") in LoopCAT. The ACF factors are applied to total loop investment (per loop) to generate the annual recurring costs (per loop). Staff witness Bob Koch (Ex. 4.0) sponsors adjustments to SBC's capital and expense cost factors based on Staff witness Mike McNally's modifications to the Cost of Capital factors (Ex. 12.0),[9] Staff witness Pete Wagner's modifications to the depreciation lives (Ex. 13.0) and his own modifications in ACF Tool. See the attached Schedule 3 for both SBC's and Staff's proposed capital and expense cost factors. The development of these cost factors are addressed in detail in Staff Ex. 4.0.

[8] Note that fiber cable costs need to be updated to reflect modification to sales tax rate as well modifications to fiber cable installation factors.
[9] Cost of Capital factors refer to Cost of Debt, Cost of Money, and Debt/Equity ratio. Cost of Debt refers to the weighted average of the long-term debt cost and short-term debt cost. Cost of Money refers to the weighted average of Cost of Debt and Cost of Equity.

Note that, while expense cost factors flow into LoopCAT directly, capital cost factors flow into LoopCAT through four distinct channels: one direct channel and three indirect channels. First, capital cost factors flow into LoopCAT directly. Second, capital cost factors flow into LoopCAT indirectly through labor rates, NID premises termination costs, and distribution terminal costs, respectively. In fact, capital cost factors flow into support assets factors, which flow into labor rates. One labor rate flows into LoopCAT directly, and two other labor rates flow into NID premises termination costs and distribution terminal costs, which are direct inputs to LoopCAT. Consequently, Staff's modifications to capital and expense cost factors are implemented in LoopCAT in four distinct ways.

First, I replaced the values in cells AI28:AN41 of the Yearly_Input tab with Staff's capital and expense cost factors, which are found in the attached Schedule 3. Second, I replaced the value in cell A11 of the Yealy_Input tab with the *updated* labor rate. Third, I replaced the values in cells A21:A22 of the Yearly_Input tab with the *updated* NID premises termination costs.[10] Finally, I replaced the values in cells B38:B41 of the Yearly_Input tab with the *updated* distribution terminal costs.[11] The updating of labor rates, NID premises termination costs and distribution

[10] Note that the updates of NID premises termination costs reflect modifications in capital cost factors (via support assets factors) as well as modifications in labor time.
[11] As will be discussed later, the updating of distribution terminal costs reflects modifications in capital cost factors (via support assets factors via labor rates) as well as modifications in labor time.

terminal costs is carried out in *IL41XX00.xls*, *IL42XX00.xls*, *IL43XX00.xls* and *Misc Material Cost 2002 (IL).xls*, respectively, and is described in detail later in this testimony.

Q. Please describe the "crossover length" and Staff's proposed modification.

A. "Loop length" in LoopCAT refers to the loop length between the Main Distribution Frame ("MDF") at the Central Office ("CO") and the Distribution Terminal ("DT") in the field. In developing TELRIC, SBC assumes that a loop is either an all-copper loop or a copper-fiber hybrid ("hybrid") loop.[12] An all-copper loop has a copper distribution cable as well as a *copper feeder cable*, and is assumed to be void of pair-gains or Digital Loop Carrier ("DLC") devices[13]. A hybrid loop has a copper distribution cable but a *fiber feeder cable*, and is served by a DLC system. Central Office Termination ("COT" or "DLC-COT") refers to DLC terminating equipment installed at the Central Office, and Remote Terminal ("RT" or "DLC-RT") refers to DLC equipment installed in the field. The fiber feeder cable connects the COT and the RT. The RT is then connected to the Feeder Distribution Interface ("FDI") via a feeder stub (buried copper cable).

[12] DS1 loop and DSL loop are the exceptions to this rule. A DS1 loop is either all-copper ("copper DS1") loop, or copper-fiber hybrid ("hybrid DS1"), or all-fiber ("fiber DS1"). A DSL loop is always an all-copper loop in LoopCAT, and none of the discussion regarding Crossover Length is applicable to DSL loops.

In developing its *forward-looking* loop investment costs, SBC assumes that all loops with a loop length equal or greater than 12,000 feet are hybrid loops and are served by a DLC system. All loops with a loop length less than 12,000 feet are assumed to be all-copper loops without any DLC equipment or pair-gain device. In short, SBC assumes a fiber-copper *crossover length* of 12,000 feet.[14]

Staff witness Bob Koch (Ex. 4.0) proposes to modify SBC's assumed crossover length. Instead of 12,000 feet, Mr. Koch proposes a crossover length of 18,000 feet. Thus, in developing loop investment costs, Staff assumes that all loops with a loop length equal or greater than 18,000 feet are hybrid loops with DLC at the COT and RT, and that all loops with a length less than 18,000 feet are all-copper loops and have no DLC equipment or pair-gain devices.

[13] Note that in SBC's actual network, some all-copper loops do have pair-gain devices or are served by a DLC system.
[14] SBC defines "Crossover Length" as the loop length at which the feeder portion of the loop is provisioned over fiber cable rather than copper cable (LoopCAT Documentation, p 16). Also note that the crossover length is not applied to DSL loops because all DSL loops are assumed to be all copper. Accordingly, none of the discussions regarding Crossover Length is applicable to xDSL loops.

To implement this modification to crossover length, I ran the SBC-provided PreProcess program and replaced the values in cells E3:P5 of the PreProcess tab (of LoopCAT) with the outputs of my PreProcess run.[15]

Note that Staff's modification to crossover length has multiple impacts on the inputs of LoopCAT. First, crossover length plays a central role in determining the *loop mix* in LoopCAT: the *copper percentage* and the *hybrid percentage*. The *copper percentage* measures the percentage of loops that are all-copper, and the *hybrid percentage* measures the percentage of loops that are hybrid. Staff's (as well as SBC's) loop mix varies across rate zones but remains the same across all loop types.[16] The loop mixes derived from the outputs of the PreProcess runs under both Staff's and SBC's proposals are summarized in Table 3 below.

Table 3: Copper-Hybrid Loop Mix

	Copper/Staff	Hybrid/Staff	Copper/SBC	Hybrid/SBC
Zone 1	*99.98%*	*0.02%*	*xx.xx%*	*x.xx%*
Zone 2	*92.29%*	*7.71%*	*xx.xx%*	*xx.xx%*
Zone 3	*60.74%*	*39.26%*	*xx.xx%*	*xx.xx%*

[15] I did not implement this modification to crossover length for the two DSL loop types, as crossover length does not apply to a DSL loop type.

[16] "Loop mix" has a slightly different interpretation for DS1 loops than for other loops. As pointed out before, a DS1 loop is either all copper ("copper DS1") or hybrid ("hybrid DS1"), or all fiber ("fiber DS1"). The *hybrid percentage* (%) measures the percentage of loops that are hybrid loops, and the complementary percentage [*i.e.*, (1-%)], accordingly, measures the percentage of loops that are NOT hybrid loops. For all (except DS1) loop types, this complementary percentage (1-%) is simply the percentage of loops that are all copper (*i.e.*, the *copper percentage*). For DS1 loops, however, the complementary percentage is the sum of the *fiber percentage* (*i.e.*, % of DS1 loops that are fiber) and the *copper percentage* (% of DS1 loops that are all copper).

By changing the crossover length from 12,000 feet to 18,000 feet, x.xx%, xx.xx% and xx.x% more loops are assumed to be all copper loops (in LoopCAT) for zones 1-3, respectively.[17] *Given all other inputs in LoopCAT (e.g.,* copper/fiber feeder lengths, copper feeder gauge mix, *etc*.), a higher percentage of hybrid loops implies a higher loop investment cost and thus implies a higher recurring UNE loop rate. For instance, take the example of *2w analog basic loop*. Based on the information provided in the Expanded Summary tab of SBC's LoopCAT runs, the feeder investment for the hybrid loop is $xxx.xx, $xxx.xx and $xxx.xx and the feeder investment for the all-copper loop is $xxx.xx, $xxx.xx, and $xxx.xx for zones 1-3, respectively.[18] As the feeder investment is much higher for a hybrid loop than for an all copper loop, changing the loop mix toward all copper loops would lead to lower loop investment costs. Therefore, *one impact of the Staff's modification in crossover length is to reduce the loop investment costs and thus reduce the recurring UNE loop rates*.

However, I must note that the above conclusion is based on the *assumption* that all the other inputs (e.g., fiber/copper feeder length, feeder gauge mix, etc.) in LoopCAT remain the same as the crossover

[17] These three percentages are the differences between Staff's and SBC's all-copper-loop percentages.
[18] To calculate these feeder investments for all copper loop and hybrid loop, I divided "Investment Per Loop" by the "Percent Occurrence" (in the Expanded Summary tab of LoopCAT) and applied SBC's power, building and land, pole and conduit factors to the appropriate components, and then added the components associated with all-copper-loop feeder and added the components

length changes from 12,000 feet to 18,000 feet. I also note that the crossover length is a crucial factor in determining the copper/fiber feeder length (in LoopCAT) as well.[19] That is, as the crossover length changes, the fiber/copper feeder length does not remain the same and it changes as well. The longer the crossover length, the longer are the copper and fiber feeder-lengths (in LoopCAT). The copper/fiber feeder length derived from the outputs of PreProcess runs under both Staff's and SBC's proposals are summarized in Table 4 below. Note that Staff's modification in crossover length increases copper feeder length by xxx, x,xxx and x,xxx feet and increases fiber feeder length by x,xxx, x,xxx and x,xxx feet for zones 1 - 3, respectively. The increases in feeder cable length would lead to increases in the loop investment costs and thus lead to increases in the associated recurring UNE loop rates.

Table 4: Copper/Hybrid Feeder Length (in feet)

	Copper/Staff	Hybrid/Staff	Copper/SBC	Hybrid/SBC
Zone 1	*3,200*	*13,353*	*x,xxx*	*xx,xxx*
Zone 2	*7,995*	*17,393*	*x,xxx*	*xx,xxx*
Zone 3	*7,486*	*18,552*	*x,xxx*	*xx,xxx*

Furthermore, changing the crossover length from 12,000 feet to 18,000 feet also changes the copper feeder cable gauge mix (in LoopCAT) — *i.e.*,

associated with hybrid-loop feeder to arrive at the total *feeder* investment for an all copper loop and the total feeder investment for a hybrid loop.

[19] Note that the crossover length does not affect the distribution cable length in LoopCAT.

the percentage of copper feeder that is 19/22/24/26 gauge, respectively.[20] The feeder cable gauge mix derived from the outputs of the PreProcess runs under both Staff's and SBC's proposals are summarized below in Table 5. The most noticeable impact of Staff's modification in crossover length on *copper feeder cable gauge mix* is the shift from higher-gauge cable to lower-gauge cable. Lower-gauge cable wire is bigger in diameter (and is thus thicker) than higher-gauge cable wire. The lower the cable gauge, the higher the cable unit investment cost (in LoopCAT). Thus, Staff's modification in crossover length leads to higher loop investment cost and higher recurring UNE loop rates by shifting copper feeder from higher gauge to lower gauge cable.

Table 5: Copper Feeder Cable Gauge (g) Mix[21]

	24 (g)/Staff	26 (g)/Staff	24(g)/SBC	26(g)/SBC
Zone 1	*1.56%*	*98.44%*	*x.xx%*	*xx.xx%*
Zone 2	*18.00%*	*81.99%*	*x.xx%*	*xx.xx%*
Zone 3	*20.50%*	*79.48%*	*x.xx%*	*xx.xx%*

In sum, increasing the crossover length (from 12,000 to 18,000 feet) has three distinct effects: First, it shifts the loop mix towards all-copper loops, which results in *lower* recurring UNE loop rates. Second, it increases the copper feeder cable length as well as the fiber feeder cable length, which

[20] "Gauge" describes the thickness (diameter) of cables. Thicker cables have a lower gauge number and can carry phone conversations further, but cost more.
[21] Staff's gauge percentages do not exactly add up to 100% (in zones 2 and 3) because approximately 0.01% of copper feeder cable is of 22-gauge for zones 2 – 3.

results in *higher* recurring UNE loop rates. Third, it shifts the copper-feeder-cable-gauge mix from higher gauge (26g) to lower gauge (24g), which is to shift from less expensive (26g) to more expensive (24g) copper cable; thus, leading to an increase in the recurring UNE loop rate. The overall impact of Staff's modification in crossover length on the loop investment and recurring UNE loop rates is the combined impacts of these various types of input changes in LoopCAT that result from Staff's modification to the crossover length.

Q. Please describe Staff's modifications to SBC's DLC-RT common investment.

A. DLC investment consists of DLC Common investment and DLC Channel Unit (*i.e.*, line cards) investment. Staff witness Bob Koch (Ex. 4.0) testifies that *DLC-RT Common* investment serves basic telecommunications services as well as advanced telecommunications services (such as xDSL). Accordingly, its investment costs should be allocated between basic and advanced services, and it is inappropriate for SBC to allocate all of the DLC-RT common investment costs to basic services. Mr. Koch proposes to remove 25% of the DLC-RT Common investment from the LoopCAT. Specifically, Mr. Koch proposes to remove 25% of the "*Total 672 Cabinet Common Investment per DS0*" in cell I106 and 25% of the "*Total 2016 Cabinet Common Investment per DS0*" in cell I115 of the DLC-RT tab of LoopCAT.

To implement Mr. Koch's proposal, a factor of 0.75 is applied to the DLC-RT Common investment in cells I106 & I115 in the DLC-RT tab of LoopCAT.

Q. Please explain Staff's modifications to DLC-RT EFI factors.

A. In its LoopCAT cost model, SBC applied two Engineering, Furnishing & Installation ("EFI") factors to its *DLC Circuit Equipment* material investment costs to calculate its DLC Circuit Equipment Investment costs: *DLC hardwire EFI* (x.xx) and *DLC plug in EFI* (x.xx). The DLC hardwire EFI factor of x.xx is applied to the hardwire components of DLC Common Investment at the RT and COT. The DLC plug in EFI factor of x.xx is applied to the plug in units of the DLC Common investment as well as to the Channel Unit investment at the RT and COT.[22]

Staff witness Peter Lazare (Ex. 3.0) proposes to modify SBC's DLC EFI factors as they relate to DLC-RT investment. Specifically, Mr. Lazare proposes to apply an EFI factor of 1.50 to (1) *all* DLC-RT Common investment components for DLC-RT of size 2,016: hardwire and plug in, and (2) DLC-RT Channel Unit investment.[23] Mr. Lazare also proposes an

[22] Note that Common Investment serves a group of loops or all the loops at the RT (or COT) while Channel Unit Investment is specific to a loop (line card). Note also that DLC Common Investment consists of hardwire components as well as plug in units, while Channel unit investment only consists of plug in components.
[23] Channel Unit Investment is the same regardless of the DLC-RT size being 2016 or 672.

EFI factor of 1.80 to *all* DLC-RT Common investment components for DLC-RT of size 672: hardwire and plug in.

Notably Mr. Lazare does not propose to modify SBC's EFI factors for DLC-COT. That is, the set of EFI factors applied to DLC-COT under Staff's proposal would be identical to those proposed by SBC (*i.e.,* x.xx & x.xx). Under Staff's proposal, consequently, one set of EFI factors (x.xx & x.xx) is applied to DLC-COT investment but a different set of EFI factors (1.80 & 1.50) is applied to DLC-RT investment. Under SBC's proposal, in contrast, the same set of EFI factors (x.xx & x.xx) is applied to both DLC-RT and DLC-COT investment.

Moreover, Mr. Lazare does not make distinction between hardwire and plug in units in the DLC-RT Common investment. That is, Mr. Lazare proposes to apply the same EFI factor to the hardwire units as well as to the plug in units of the DLC-RT Common investment: 1.50 to DLC-RT of size 2,016, and 1.80 to DLC-RT of size 672. Furthermore, Mr. Lazare proposes to apply his EFI factor for DLC-RT of size 2,016 (1.5) to the DLC-RT Channel Unit investment.

To implement Mr. Lazare's proposal, I placed Staff's proposed EFI factors for the 2016- and 672-DLC-RT Common Investment in cells AK19 (1.50) and AK20 (1.80) in the Yearly_Input tab (of LoopCAT), and made the

following modifications to the formulas in the DLC_RT_Cabinets tab (of LoopCAT):

(1) *Digital Loop Carrier System – 2016 Cabinet*:

Change the links in cells H13:H19 of the DLC_RT_Cabinets tab from AF19:AF20 (Yearly_Input tab) to links AK19 (Yearly_Input tab). This is equivalent to replacing x.xx and x.xx in H13:H19 with 1.50.

(2) *Digital Loop Carrier System – 672 Cabinet*:

Change the links in cells H49:H55 (DLC_RT_Cabinets tab) from AF19:AF20 (Yearly_Input tab) to AK20 (Yearly_Input tab). This is equivalent to replacing x.xx and x.xx in H49:H5 with 1.80.

(3) *DLC Litespan LS200 – RT Channel Units*:

Change the links in H87:H96 (DLC_RT_Cabinets tab) from AF20 (Yearly_Input tab) to AK19 (Yearly_Input tab). This is equivalent to replacing x.xx in cells with 1.50.

Q. Please describe Staff' modifications to the copper installation factors.

A. Copper cable Design & Installation factors ("installation factors") are applied to copper cable (both feeder and distribution)[24] as well as to

[24] Copper installation factors should also be applied to Intra-building copper cables (see the attached Schedule 2).

terminal equipment (such as FDI, Building Terminal)[25] in LoopCAT. Staff witness Peter Lazare proposes modifications to SBC's installation factors. See the attached Schedule 4 for both Staff's and SBC's proposed installation factors.

To implement Mr. Lazare's proposal, I replaced the values in cells C15:F18 in the Yearly_Input tab of LoopCAT with the copper installation cost factors provided by Mr. Lazare, which are found in the attached Schedule 4.

Q. Please describe Staff's modifications to SBC's fiber cable costs.

A. Unlike the copper installation factors, fiber installation factors do not flow into LoopCAT directly. Instead, they are used in *AIT Fiber Cost Summary 2002 (IL).xls* ("fiber cable cost model") to generate the *fiber cable* (*per foot*) *costs*, which flow directly into LoopCAT. Staff's fiber cable costs reflect two of Staff's proposed changes: (1) sales tax rate, and (2) fiber installation factors. Staff witness Peter Lazare (Ex. 3.0) sponsors the modification to the sales tax as well as the modifications to the fiber installation factors. See the attached Schedule 4 for both SBC's and Staff's proposed fiber installation factors and fiber cable (per foot) costs.

[25] LoopCAT assumes that cables terminating at the Feeder Distribution Interface are buried cables, and thus buried cable installation factors are applied to FDI connections (*i.e.*, assuming

To implement modifications to the fiber cable costs in LoopCAT, I replaced the values in cells B48:D50 in the Yearly_Input tab with the *updated* fiber cable costs.

To update the fiber cable costs, I replaced the SBC sales tax factor of x.x% in cell B2 and SBC's fiber installation factors in cells C26:E29 of the Inputs tab (of *AIT Fiber Cost Summary 2002 (IL).xls*) with Staff's sales tax factor of 7.14% and fiber installation costs, which are found in the attached Schedule 4.

Q. Please describe Staff's modifications to SBC's fill factors.

A. SBC has provided the following fill factors or fill factor-related inputs to LoopCAT: (1) building terminal fill factors, (2) lines per premises, (3) distribution cable fill factors, (4) copper feeder cable fill factors, (5) DLC Chassis fill factors, and (6) DLC plug in fill factors.

Building terminal fill factors are applied to building terminals, and *lines per premises* are used to generate fill factors for the NID premises termination[26].

FDI connections have the same installation factors as the cables connected to the FDI connections).

[26] For NID premises terminations (i.e., a premises termination served by a NID), fill factors are simply the "lines per premise" divided by 6 (*i.e.,* assuming the NID is sized at 6 connections).

Distribution and copper feeder cable fill factors apply to distribution and cooper feeder cables *as well as* to installation of distribution and copper feeder cables.

DLC plug in fill factors apply to DLC channel unit (*i.e*., line card) investment. DLC Chassis fill factors, in contrast, apply to (1) DLC common investment and (2) Feeder stub, and (3) fiber feeder cable.[27]

Notably, under SBC's proposal, all (except DLC plug in) fill factors remain the same across loop types (2w analog basic, 4w analog, 2w DSL, 4w DSL, BRI, COIN, DS1, EKL, and Ground Start). For DLC plug in, one set of fill factors applies to DS1 loops and a different set of fill factors applies to all the other eight loop types. Further, SBC's proposed fill factors vary across rate zones 1-3.

Under Staff's proposal, however, all (except NID premises termination) fill factors are *constant* across all *loop types* as well as across all *rate zones*. Staff does not propose to modify SBC's "lines per premises" and, thus, adopts SBC's fill factors for NID premises termination. As a result, the NID premises termination fill factors under Staff's proposal vary across rate zones but are constant across loop types. See the attached

[27] SBC applies both the DLC chassis fills and the percentage of active fiber strand in developing the fiber cable investment costs.

Schedule 5 for both Staff's and SBC's proposed fill factors and fill factor-related inputs (for LoopCAT). See Staff Ex. 8.0 for a full discussion of Staff's modifications to SBC's fill factors.

I implemented these modifications to SBC's fill factors by making the following alterations in the Yearly_Input and PreProcessFill tabs of LoopCAT:

(1) *Building Terminal Fill Factors*:

Replace values in cells B69:F77 of the Yearly_Input tab with Staff's building terminal fill factor of 80%;

(2) *Distribution Cable Fill Factors and Distribution Installation Fill Factors*:

Replace SBC's distribution cable fill factors in cells I2:I5 & I11:I14 and SBC's distribution installation fill factors in cells L2:L5 & L11:L14 of the PreProcessFill tab of LoopCAT with Staff's fill factor of 0.80;

(3) *Copper Feeder Cable Fill Factors and Copper Feeder Installation Fill Factors*:

Replace SBC's copper feeder fill factors in cells F2:F5 & F11:F14 and SBC's copper feeder installation fill factors in cells K2:K5 &

K11:K14 of the PreProcessFill tab of LoopCAT with Staff's fill factor of 0.85;

(4) *DLC plug in Fill Factor*:

Replace SBC's DLC plug in fill factors in cells H2:H5 & H11:H14 with Staff's DLC plug in fill factor of 0.90; and

(5) *DLC Chassis Fill Factor*:

Replace SBC's DLC Chassis fill factors in cells G2:G5 & G11:G14 with Staff's DLC Chassis fill factor of 0.90.

Note that loop investment costs and recurring UNE loop rates move in the opposite direction as the fill factors do. As Staff's fill factors represent significant increases from SBC's proposed fill factors, Staff's modifications to fill factors lead to lower TELRICs and lower recurring UNE loop rates than those proposed by SBC in this proceeding.

Q. Please describe Staff's modifications to residential/business percentages.

A. In LoopCAT, a premises termination is one of two types:

(1) *NID Premises Termination*:

Network Interface Device ("NID"),

Service Wire (Drop Wire), and

Distribution Terminal.

Or

(2) *BT Premises Termination*:

Building Terminal (BT), and

Building Entrance Facilities (Intra-building cables).

A Network Interface Device ("NID") serves a structure that has no more than six copper-pairs or lines (*e.g.*, a single-dwelling structure – a house, or a double-dwelling structure – a duplex). The NID is connected to a Distribution Terminal (which is located near the premises) via a service wire (*i.e.*, drop wire), and the Distribution Terminal is then connected to distribution cable.[28]

A Building Terminal, in contrast, serves a structure that has more than six pairs of copper wires (or lines). Multi-dwelling structures such as apartment buildings, condominium and business complexes are served by building terminals. Unlike a NID, a Building Terminal is connected to the rest of the network via building entrance facilities (instead of by service wire and a distribution terminal).[29] LoopCAT assumes eight Building Terminal sizes: 25, 50, 100, 200, 300, 400, 600, and 900.[30]

[28] A telecommunications carrier's network ends at the network demarcation point – the NID. The inside wiring (from the NID onward) is the responsibility of the building or homeowner. Thus, the NID serves as the telecommunications network's demarcation point.
[29] Intra-building cable (wire) runs between the building entrance and the building terminal.
[30] Building terminal (BT) size refers to the maximum number of connections on the BT.

Due to economies of scale, the per-connection cost of a Building Terminal of size 25 is generally much higher than the per-connection cost of a Building Terminal of a larger size. For instance, the (fill factor-adjusted) unit investment is $x.xx for a Building Terminal of size 25, while it is less than $x.xx for a Building Terminal of size 200 or larger.[31]

Moreover, the (per-line) premises termination investment cost is much higher for a NID premises termination than for a BT premises termination with a Building Terminal of any size (assumed in LoopCAT). After adjustments for fill factors and installation, for instance, the per-connection (size 25 aerial) BT premises termination investment is $xx.xx,[32] while the per-connection (aerial) NID premises termination investment is $xxx.xx.[33]

In LoopCAT, SBC treated *all* residential lines as if they were served by NID premises terminations.[34] This assumption (whether made for convenience or practicality) fails to reflect the fact that residential lines at apartment buildings, condominiums and business complexes are served

[31] See "Premises Termination – Business" tab in 2w analog (Zone 1) LoopCAT.
[32] The $xx.xx = $xx.xx + $x.xx. The $xx.xx is derived by applying the installation factors (C33:C36) to the unit investment for size-25 BT (K13) in *Premise Termination – Business* tab in LoopCAT. The $x.xx is derived by applying the installation factors (C88:C91) to the unit investment for Intra-building cables for size-25 BT (J73) in *Premise Termination – Business* tab in LoopCAT.
[33] The $xxx.xx is the unit investment for aerial NID premise termination on the Premises_Termination_Res tab of LoopCAT.
[34] In SBC's LoopCAT runs, a portion of business lines are served by NID premises terminations, and all the other business lines are served by building terminals of the following sizes: 25, 50, 100, 200, 300, 400, 600, and 900.

by (less expensive) building terminals (or BT premises termination)[35]. As indicated above, NID premises termination investment is much higher than BT premises termination (of all sizes assumed in LoopCAT). SBC's assumption would undoubtedly overstate the investment cost of *residential* premises termination, and, consequently, the premises termination monthly recurring cost, which is the weighted average of residential premises termination and business premises termination. Staff witness Dr. Jim Zolnierek (Ex. 7.0) opines that one way to reduce this type of overstatement is to *treat those residential lines that are served by Building Terminals as business lines for cost purpose in LoopCAT.* Dr. Zolnierek, thus, proposes to modify SBC's residential/business percentages of xx.xx% & xx.xx% to 48.57% & 51.43%, respectively.

To implement this modification, I replaced the residential percentage in cell A32 in the User_Input tab (of LoopCAT) with Staff's proposed residential percentage of 48.57% for all (except DS1) loop types.

The overstatement of investment cost cited above is caused by treating all residential lines as NID premises termination lines and is thus caused by the bias toward NID premises terminations for residential lines. This bias does not cause problems for DS1 loops because SBC assumes (in

[35] "Residential lines at business complex" refers to situations in which both residential and business lines reside in the same business complex.

LoopCAT) that there are no residential DS1 loops and, alternatively, all DS1 loops are for business users. Therefore, Staff's modification to residential/business percentages has no impact on the DS1 loop investment calculation.

Q. Please describe Staff's modifications to SBC's NID Premises Termination.

A. NID premises termination costs are $xxx.xx (buried) & $xxx.xx (aerial) under SBC's proposal and $187.16 (buried) & $198.80 (aerial) under Staff's proposal. Staff's modifications to SBC's NID premises termination costs reflect the following two modifications: (1) labor time, and (2) capital cost factors.

First, in developing the investment costs for NID premises termination, SBC assumes a labor time of x.x hours (buried) and x.x hours (aerial). Staff witness Peter Lazare (Ex. 3.0) testifies that SBC's assumed labor time is inappropriate and proposes alternative labor time of 1.05 hours (buried) and 1.67 hours (aerial). These changes in labor time directly flow into the calculation of NID premises termination investment costs.

Second, as discussed earlier, Staff witness Bob Koch (Ex. 4.0) proposes modifications to SBC's capital cost factors. These modifications in capital cost factors flow into the calculation of support asset factors, which flow

into the calculation of labor rates. As labor rates are applied to the labor time in *Misc Material Cost 2002 (IL).xls* to generate the NID premises termination costs, Staff's modifications to capital cost factors lead to changes in the NID premises termination costs (via support assets factor). The labor rate for NID premises termination is $xx.xx under SBC's proposal and $72.61 under Staff's proposal (the updating of labor rates is described in detail later in this testimony).

In sum, Staff's modifications to NID premises termination costs result from Staff's proposed changes in labor time and capital cost factors.

To implement the modifications to the NID premises termination costs in LoopCAT, I replaced SBC's NID premises termination costs of $xxx.xx (buried) and $xxx.xx (aerial) in cells A21:A22 of the Yearly_Input tab with Staff's buried and aerial NID premises termination costs of $187.16 and $198.80, respectively.

Staff's proposed buried/aerial NID premises termination costs of $187.16/$198.80 are calculated by replacing SBC's proposed labor time of x.x/x.x hour and labor rate of $xx.xx with Staff's labor time of 1.05/1.67 hour and labor rate of $72.61 in the *NID_Drop Wire tab* of the *Misc Material Cost 2002 (IL).xls*.

Q. Please explain Staff's modifications to SBC's Distribution Terminal costs.

A. A Distribution Terminal is an interface that connects the distribution cable and the service wire (*i.e.*, drop wire). The Distribution Terminal cost is $xxx.xx under SBC's proposal and $183.16 under Staff's proposal. Similar to the case of NID premises termination, the changes in Distribution Terminal costs reflect the following two changes: (1) labor time, and (2) capital cost factors.

First, Staff witness Peter Lazare (Ex. 3.0) proposes to change SBC's labor time of x.x hours to 1.8 hours. This modification in labor time flows into the calculation of Distribution Terminal costs.[36]

Second, the *labor rate* used in the calculation of Distribution Terminal costs is $xx.xx under SBC's proposal and $74.26 under Staff's proposal. The change in labor rate reflects changes in the capital cost factors (generated by CAPCS Tool) via support asset factors. Thus, Staff's modifications to capital cost factors indirectly affect Distribution Terminal costs via labor rate.[37]

[36] See Staff Ex. 3.0 (Lazare) for details of this alternative labor time.
[37] See Staff Exhibit 4.0 (Koch) for Staff's proposed modifications in capital cost factors.

The modifications to Distribution Terminal costs are implemented in LoopCAT by replacing SBC's Distribution Terminal cost of $xxx.xx in cells B38:B41 of the Yearly_Input tab with Staff's Distribution Terminal cost of $183.16.

Staff's Distribution Terminal cost of $183.16 is calculated by replacing SBC's labor time of x.x hours and labor rate of $xx.xx with Staff's labor time of 1.8 hours and labor rate of $74.26 in the *Terminal tab* of the *Misc Material Cost 2002 (IL) .xls*.

Labor Rate

Q. Please describe the labor rates that you updated and how you updated them.

A. As noted above, some of Staff's proposed changes flow into the calculation of labor rates, which in turn flow into recurring loop costs. Three labor rates have been identified that affect recurring loop costs and all are non-management labor rates:

(1) *Cost Group 41XX Communications Technician* (*IL41XX00.xls*): Flowing into the calculation of NID premises termination costs;

(2) *Cost Group 42XX Outside Plant Technician* (*IL42XX00.xls*): Flowing into the calculation of Distribution Terminal cost; and

(3) *Cost Group 43XX Communications Technician* (*IL43XX00.xls*):

Flowing directly into LoopCAT (cell A11 of Yearly_Input tab).[38]

These three labor rates need to be updated to reflect changes in support assets factors, which in turn reflect changes in capital cost factors (generated by the CAPCS Tool).

Q. Are there any other labor rates that are affected by Staff's modifications? If so, did you also update these other labor rates?

A. SBC provided the calculation of labor rates for seventeen Cost Groups with several labor rate elements in each Cost Group.[39] Under SBC's proposal, capital cost factors flow into the calculation of all seventeen categories of labor rates (via support asset factors). The three above-cited labor rates are used in developing recurring loop costs and recurring UNE loop rates ("recurring labor rates"). Because Staff witness Bob Koch modified SBC's capital cost factors, these (recurring) labor rates needed to be updated so that Staff's recurring UNE loop rates would fully reflect all the changes proposed by Staff.

Admittedly, labor rates also flow into the nonrecurring cost studies (*non-recurring labor rates*). Under SBC's proposal, all non-recurring (as well as all recurring) labor-rate elements are impacted by capital cost factors (via

[38] This labor rate is applied (in LoopCAT) to the labor hours for placing Prot./Connect. Block on the Main Distribution Frame ("MDF") at the Central Office.

support asset factors). However, Staff witness Mark Hanson (Ex. 6.0) has determined that support assets should not be included in the calculation of labor rates *for purposes of non-recurring cost studies*. Therefore, labor rates for non-recurring cost studies are updated (by Mr. Hanson) by setting the support asset factors to zero.

Notably, some labor rate elements (*e.g.*, Cost Group 43XX Telecommunication Technician – non-management) flow into both recurring loop costs and non-recurring costs. In this sense they are both *recurring labor rate elements* and *non-recurring labor rate elements*. As a result, there would be two sets of labor rates for these labor rate elements under Staff's proposal: one for recurring loop costs, and the other for non-recurring costs, while there is only one set of labor rates applied to both recurring loop costs and non-recurring costs under SBC's proposal.

In sum, I updated the three (recurring) labor rates for recurring loop costs to reflect Staff's modifications in capital cost factors (via support asset factors). Mr. Hanson, in contrast, updated the (non-recurring) labor rates for non-recurring cost studies by setting the support asset factors to zero in the calculation of the non-recurring labor rates.

[39] These seventeen Cost Groups are: IL02XX, IL05XX, IL14XX, IL16XX, IL18XX, IL22XX, IL27XX, IL31XX, IL32XX, IL33XX, IL36XX, IL41XX, IL42XX, IL43XX, IL44XX, IL46XX and IL47XX.

Q. Please describe how you implemented the changes in support asset factors in the calculation of recurring labor rates.

A. The four support asset factors used in the calculations of labor rates are: (1) Opr. & SA, (2) Other, (3) Plant Related, and (4) SVC. Reps., and they are generated in the *Ameritech Support Assets 2001.xls* ("support asset file"). The four factors are x.xxxx, x.xxxx, x.xxxx and x.xxxx under SBC's proposal and 0.1420, 0.2923, 0.4409 and 0.2888 under Staff's proposal. To update the three labors rates, I updated the support asset factors in the Loading tab of labor rate files *41XX00.xls*, *42XX00.xls* and *43XX00.xls* ("labor rate files"). Specifically, I replaced values in cells D23, D24, D25 and D26 in the Loading tab (of the labor rate files) with values in cells G24, I24, F24 and H24 in the SA_1 tab of the support assets file (updated by Mr. Koch), respectively.

Staff's labor rates for the above-listed three recurring labor rate elements are $72.61, $74.26 and $67.93, as opposed to SBC's $xx.xx, $xx.xx and $xx.xx.

DS1 and DS3 Circuit Equipment

Q. Please explain why DS1 and DS3 Circuit Equipment Investment is relevant to recurring UNE loop rates.

A. The DS1 loop TELRIC from the *Unbundled Loop TELRIC Recurring Cost Study* ("Recurring Loop Study") covers both the loop costs generated by

LoopCAT and the investment cost of additional Circuit Equipment from *IL_2002_DS1 Loop Circuit Equipment (*).xls*. That is, the DS1 Circuit Equipment from *IL_2002_DS1 Loop Circuit Equipment (*).xls* is part of the DS1 loop.

The DS3 loop TELRIC from the *Unbundled DS3 Loop Recurring Cost Study* ("DS3 Recurring Loop Study") covers the fiber facilities cost, which is generated in this DS3 Recurring Loop Study, and DS3 Circuit Equipment Investment cost, which is generated in *IL_2002_DS3 Loop Circuit Equipment (*).xls*. That is, the DS3 Circuit Equipment from *IL_2002_DS3 Loop Circuit Equipment (*).xls* is part of the DS3 loop.

Consequently, these DS1 and DS3 Circuit Investment costs must be updated so that Staff's proposed DS1 & DS3 TELRICs and recurring UNE loop rates would fully reflect all changes proposed by Staff witnesses.

Q. Please explain how you updated DS1 Circuit Equipment Investment.

A. The updating of DS1 Circuit Equipment Investment reflects Staff's proposed changes in (1) sales tax, and (2) capital and expense cost factors, and are accomplished by making the following modifications in the *Input tab* of the *IL_2002_DS1 Loop Circuit Equipment (*).xls*.

First, SBC's proposed sales tax rate of x.x% in cell D19 of the Input tab is replaced with Staff's sales tax rate of 7.14%.

Second, SBC's proposed capital cost factors for Building, Land, Circuit Equipment and Premise Equipment in cells D37:D39, F37:F39, H37:H39, and J37:J39 of the Input tab are replaced with the respective Staff's proposed capital cost factors for these four elements, which are found in the attached Schedule 3.

Third, SBC's proposed expense cost factors for Building, Land, Circuit Equipment and Premise Equipment in cells D42:D44, F42:F44, H42:H44, and J42:J45 of the Input tab are replaced with the respective Staff's proposed expense cost factors for these four elements, which are found in the attached Schedule 3.

Note that the Circuit Equipment Investment model *IL_2002_DS1 Loop Circuit Equipment (*).xls* calculates the Circuit Equipment Investment cost for three DS1 loop types: (1) Copper, (2) Fiber, and (3) Copper-Fiber Mixed ("Mixed"). The updating described above produces Staff's three Circuit Equipment Investment costs for each rate zone. See the attached Schedule 6 for both Staff's and SBC's nine Circuit Equipment Investment costs (three for each rate zone).

I further calculated the weighted average of the three Circuit Equipment Investment costs for each rate zone using the weighting factors that I took from Tab 7.7 of SBC's *Unbundled Loop TELRIC Recurring Cost Study*. See the attached Schedule 6.[40] The three weighted Circuit Equipment Investment costs (one for each rate zone) under Staff's as well as under SBC's proposal are also found in the attached Schedule 6.

Q. Please explain how you updated DS3 Circuit Equipment Investment.

A. The updating of DS3 Circuit Equipment Investment costs is similar to the updating of DS1 Circuit Equipment Investment and it also reflects Staff's proposed changes in (1) sales tax, and (2) capital and expense cost factors, and are accomplished by making the following modifications in the Input tab of the *IL_2002_DS3 Loop Circuit Equipment (*).xls*.

First, SBC's proposed sales tax rate of x.x% in cell D20 of the Input tab is replaced with Staff's proposed sales tax rate of 7.14%.

Second, SBC's proposed capital cost factors for Building, Land, Circuit Equipment and Premise Equipment in cells D38:D40, F38:F40, H38:H40, and J38:J40 of the Input tab are replaced with the respective Staff's

[40] Note that for DS1 loop in zone 1, SBC's weighting factors for copper DS1, fiber DS1 and hybrid DS1 add up to 99.95% (not 100% as they should have). In the Expanded Summary tab of DS1 LoopCAT, the fiber cable occurrence is xx.xx%, which is 0.1% greater than the sum of the fiber DS1 loop percentage (xx.x%) and the hybrid DS1 loop percentage (x.x%).

proposed capital cost factors for these four elements, which are found in the attached Schedule 3.

Third, SBC's proposed expense cost factors for Building, Land, Circuit Equipment and Premise Equipment in cells D43:D45, F43:F45, H43:H45, and J43:J45 of the Input tab are replaced with the respective Staff's proposed expense cost factors for these four elements, which are found in the attached Schedule 3.

See the attached Schedule 7 for both Staff's and SBC's DS3 Circuit Equipment Investment costs.

Q. Did you make any additional modifications to DS1 and DS3 Circuit Equipment Investment?

A. No. As noted above, my responsibility in this proceeding is limited to updating and modifying various cost models and cost studies to reflect Staff's proposed changes. Staff witness Bob Koch (Ex. 4.0), however, examined the appropriateness of these DS1 and DS3 Circuit Equipment Investment cost models (as well as cost studies). Mr. Koch has concluded that no additional changes are required at this time.

Unbundled Loop TELRIC Recurring Cost Study

Q. Please describe the scope of SBC's *Unbundled Loop TELRIC Recurring Cost Study*.

A. SBC's *Unbundled Loop TELRIC Recurring Cost Study* ("*Recurring Loop Study*") calculates the TELRIC for the nine loop types cited earlier in this testimony: (1) 2w Analog basic, (2) Analog PBX Ground Start, (3) Analog COPTS Coin, (4) Analog EKL, (5) 4w Analog, (6) 160 Kbps (ISDN-BRI), (7) 2w ADSL & 2w HDSL, (8) 2w ADSL & 4wHDSL, and (9) 1.544 Mbps (DS1).

Q. Do you need to update the *Recurring Loop Study* for purposes of calculating the TELRIC for the first eight loop types (listed above)?

A. No. The TELRIC from the *Recurring Loop Study* for the first eight loop types is identical to the respective monthly recurring loop cost generated by LoopCAT. That is, the *Recurring Loop Study* does not have any add-on values for the calculation of TELRIC for these eight loop types. In other words, the output of LoopCAT for these eight loop types is their respective TELRIC. Therefore, I do not need to *update* or *use* the *Recurring Loop Study* in order to arrive at Staff's proposed TELRICs for these eight loop types.

See the attached Schedule 8 for both Staff's and SBC's proposed TELRICs for these twenty-four rate elements [8 (loop types) x (3 rate zones)].

Notably Staff's TELRIC for these eight loop types represent a significant reduction from those proposed by SBC. The percentage reduction in TELRIC ranges from xx.xx% to xx.xx% across these eight loop types and three rate zones (*i.e.*, across these twenty-four TELRICs).

Q. Do you need to update the *Recurring Loop Study* for purposes of calculating a *DS1* Loop TELRIC?

A. Not necessarily. I must note that the DS1 loop is different from the other eight loop types in that LoopCAT does not generate the TELRIC for DS1 loop. The output of the DS1 LoopCAT has to be combined with the DS1 Circuit Equipment Investment costs from *IL_2002_DS1 Loop Circuit Equipment (*).xls* to arrive at the DS1 loop TELRIC. This is accomplished in the *Recurring Loop Study,* although it could be done easily outside this cost study. In calculating Staff's DS1 loop TELRIC, I did not update or use this Recurring Loop Study. Instead, I added the monthly recurring DS1 loop cost (from Staff's DS1 LoopCAT) to Staff's *weighted* DS1 Circuit Equipment Investment cost, which I calculated and presented in the attached Schedule 6.

See the attached Schedule 8 for both Staff's and SBC's DS1 loop TELRICs. Note that Staff's DS1 loop TELRICs represent a significant reduction from those by SBC. The percentage reduction in DS1 loop TELRIC is xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively.

Q. Did you make any additional modifications to the calculation of TELRIC for the nine types of loops listed above?

A. No. As stated earlier, my responsibility in this proceeding is limited to revising various SBC cost models and cost studies to reflect all of Staff's proposed modifications. Staff witness Bob Koch (Ex. 4.0) addressed the appropriateness of these cost studies and determined that no additional changes are required at this time.

Unbundled DS3 Loop TELRIC Recurring Cost Study

Q. Please describe the scope of SBC's *Unbundled DS3 Loop TELRIC Recurring Cost Study*.

A. The TELRIC for a DS3 loop consists of (1) *Circuit Equipment Investment costs* and (2) *Fiber Facilities Investment costs*. The DS3 Circuit Equipment Investment cost is calculated in *IL_2002_DS3 Loop Circuit Equipment (*).xls.* The Fiber Facilities Investment cost is developed in the *Unbundled DS3 Loop TELRIC Recurring Cost Study* ("DS3 Recurring Loop Study") using the fiber cable (per foot) costs from the *AIT Fiber Cost*

Summary 2002 (IL).xls. To arrive at Staff's DS3 fiber facilities cost, I updated the DS3 recurring study based on Staff's modifications.

Q. Please describe the revisions you made in the DS3 Recurring Loop Study.

A. To derive Staff's TELRIC for a DS3 loop, I made the following adjustments in the DS3 Recurring Loop Study.

First, I replaced SBC's proposed fiber cable (per foot) costs in cells C45:C47, C50:C52, & C55:C57 in the Inputs tab with the fiber cable (per foot) costs that I revised based on Staff's proposed changes in sales tax rate and fiber installation factors.

Second, I replaced SBC's proposed capital and expense cost factors for aerial/buried/underground fiber cables, conduit and poles in cells C166:C171, C154:C159, C130:C135, C142:C147, & C178:C183 in the Inputs tab with the respective Staff's proposed capital and expense cost factors.[41]

[41] I accomplished this in two steps: (1) linking the capital and expense cost factors in the Inputs tab with the respective cells in TAB 8.5 of the DS3 Recurring Loop Study, and (2) replacing the capital and expense cost factors in TAB 8.5 of the DS3 Recurring Loop Study with the respective Staff's capital and expense cost factors.

Third, I replaced SBC's DS3 Circuit Equipment Investment costs in cells C188:C190 in the Inputs tab with Staff's DS3 Circuit Equipment Investment costs, which are found in the attached Schedule 8.

See the attached Schedule 8 for Staff's as well as SBC's DS3 loop TELRICs. Note that that Staff's DS3 loop TELRICs represent a significant reduction from those proposed by SBC. The percentage reduction from SBC's proposed TELRIC is xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively.

Q. Please list Staff's proposed modifications behind the revisions of the DS3 Recurring Loop Study.

A. The revisions in the DS3 Recurring Loop Study are intended to reflect Staff's modifications in: (1) sales tax rate, which flows into DS3 Circuit Equipment Investment costs and fiber cable (per foot) costs, (2) capital and expense cost factors, which flow into the DS3 Recurring Loop Study directly, as well as indirectly through DS3 Circuit Equipment Investment costs; and (3) fiber installation factors, which flow into fiber cable (per foot) costs.[42]

[42] SBC's Cost of Money (COM) factor of xx.xx% also appears in the Input tab of the DS3 Recurring Loop Study. Accordingly, I updated this factor with Staff's COM factor of 8.62%. However, I am not able to trace any use of this factor in the DS3 Recurring Loop Study.

Q. Do you propose to make any revisions in addition to the above updates to the DS3 Recurring Loop Study?

A. No. As stated before, my responsibility in this proceeding is limited to revising various cost models and cost studies to reflect Staff's proposed modifications. Staff witness Bob Koch addressed the appropriateness of the DS3 recurring study and has concluded that no additional revisions to the DS3 Recurring Loop Study are necessary at this time.

Recurring UNE Loop Rates

Q. Please describe how you derived the recurring UNE loop rates from the loop TELRIC costs.

A. As stated before, the recurring UNE loop rate is generally the TELRIC with a Share & Common (S&C) markup, *i.e.*,

*UNE rate = (1 + S&C factor) * TELRIC.*

Due to different approaches to Shared & Common cost studies, however, what is recovered *only* through the Shared & Common markups under SBC's proposal are recovered through Shared & Common markups *and* Uncollectible markups under Staff's proposal. That is, while SBC calculates its UNE rates according to the above formula, Staff calculates its UNE rates according to the following formula:

UNE rate = (*1 + Uncollectible*)*(*1 + S&C factor*) * *TELRIC*.[43]

The Shared & Common and Uncollectible factors are 10.74% and 3.93%, respectively, under the Staff's proposal.[44] As a result, to calculate the recurring UNE loop rate, I simply applied a markup of 15.09% to the respective TELRIC; *i.e.*, multiplying the respective TELRIC by a factor of 1.1509.[45] Both Staff's and SBC's proposed thirty recurring UNE loop rates are presented in the attached Schedule 8.

Notably Staff's UNE rates represent a significant reduction from those proposed by SBC. The percentage reduction in UNE loop rate ranges from xx.xx% to xx.xx% across all (except DS3) loop types and three rate zones (*i.e.*, across the twenty-seven rate elements). For DS3 loop, the percentage reduction is xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively.

Q. Are you responsible for addressing the appropriateness of SBC's Shared & Common Cost Study?

A. No. My role regarding the Shared & Common ("S&C") Cost Study is limited to calculating and providing the twenty-four "Cable & Wire Facilities Investment" figures, which are used to update the formulas in column C

[43] See Staff Exhibit 8.0 (Patrick) and Staff Exhibit 9.0 (Smith) for a full discussion of Staff's approach to the Shared & Common Cost Study.
[44] See Staff Ex. 8.0 (Patrick) and Staff Ex. 9.0 (Smith).
[45] Note that 15.09% = [10.74% + 3.93% + (10.74%)*(3.93%)], and 1.1509 = (1 + 15.09%).

and Lines 148 – 155 of the Inputs tab of the Shared & Common Cost Study (*i.e.*, *IL_SC_2001-12-13-02.xls*).

Staff witnesses Melanie Patrick (Ex. 8.0) and Tom Smith (Ex. 9.0) addressed the appropriateness of the SBC's Shared & Common Cost Study and developed the S&C factor of 10.74% (Ex. 8.0) and Uncollectible factor of 3.93% (Ex. 9.0). As noted above, the two factors combined would give rise to the Staff's (UNE rate over TELRIC) markup of 15.09%, as opposed to SBC's proposed markup of xx.xx%.

Sensitivity Analysis

Q. Please explain the sensitivity analysis.

A. The sensitivity analysis I performed on Staff's proposed input changes assesses the impact of a change to a (SBC's proposed) input on SBC's proposed TELRIC — that is, the change in SBC's proposed TELRIC that results *solely* from the change to a particular input. The sensitivity analysis also applies to modifications to a set of inputs. For example, the sensitivity of Staff's modifications to fill factors (as a whole) measures the change in SBC's proposed TELRIC if we were to replace SBC's fill factors with Staff's fill factors but leaving all other SBC's inputs intact.[46]

Q. For what loop type did you perform sensitive analyses?

A. I performed sensitivity analyses for one loop type and three rate zones: 2w analog basic.

Q. Please describe all the sensitivity analyses you performed.

A. I performed eleven sensitivity analyses in this proceeding (for each rate zone), among which seven are conducted on a set of inputs ("multiple-inputs sensitivity analysis") and four are conducted on an individual input ("single input sensitivity analysis").

Multiple-inputs sensitivity analysis is conducted on each of the following sets of inputs:

(1) *Fill Factors*: DLC Chassis, DLC plug in, feeder/distribution cable, feeder/distribution installation;[47]

(2) *Depreciation Lives*: depreciation lives of all items in the Input tab of CAPCS Tool;

(3) *Cost of Capital Factors*: Cost of Debt, Cost of Money, and debt/equity ratio;[48]

[46] Note that Staff does not propose changes to all SBC's fill factors in LoopCAT. As noted before, Staff does not propose to modify SBC's fill factors for NID premises termination.
[47] As noted before, fill factors for installation of feeder/distribution cables are the same as the fill factors for feeder/distribution fills.
[48] Cost of Debt refers to the weighted average of cost of long-term debt and cost of short-term debt. Cost of Money refers to the weighted average of Cost of Equity and Cost of Debt. See Staff Exhibit 12.0 (Mike McNally) for Staff's proposed changes to these factors.

(4) *Labor Time*: installation time for NID premises termination, and installation time for distribution terminal;

(5) *DLC EFI*: DLC-RT hardwire and plug in EFI factors;

(6) *DLC-RT Common*: common investment costs for DLC-RT of size 2016, and common investment costs for DLC-RT of size 672; and

(7) *Installation Factors*: copper cable installation factors and fiber cable installation factors.

Single-input sensitivity analysis is conducted on each of the following single inputs:

(8) *R/B Percentage*: residential and business line percentages;

(9) *Crossover*: fiber-copper crossover length;

(10) *Sales Tax*: sales tax rate; and

(11) *FDI Fill*: formulas of FDI fill factor.

I note that some sensitivity analyses (multiple-inputs or single-input) *only* involve direct input changes in LoopCAT – *i.e.*, involving the replacement of SBC's input values with Staff's input values in LoopCAT. For DLC EFI sensitivity analysis, for instance, I simply replaced the SBC's proposed DLC-RT EFI factors with Staff's proposed DLC-RT EFI factors in LoopCAT directly.

Other sensitivity analyses (multiple-inputs or single-input), however, involve Staff's proposed input changes flowing into LoopCAT through multiple channels. Take the examples of Sales Tax (single-input) and Depreciation Lives (multiple-inputs). Sales tax rate flows into LoopCAT directly, but it also flows into LoopCAT *through* fiber cable (per foot) costs. Deprecation Lives flow into LoopCAT only indirectly but through four different channels*:* (1) *capital cost factors*, (2) labor rate, (3) NID premises termination costs, and (4) distribution terminal costs.[49]

I further note that some sensitivity analyses do not involve any changes to SBC's inputs in LoopCAT. Rather, they involve changes in the formulas in LoopCAT. Such an example includes FDI sensitivity analysis, for which I *only* changed SBC's formulas for FDI fills in cell D37:D38 in the FDI tab of LoopCAT.

Finally, for each of the eleven sensitivity analyses I calculated: (1) SBC's (would-be) TELRIC and (2) the percentage change in SBC's TELRIC that would result if we were to replace one of SBC's inputs or a set of SBC's inputs with the respective Staff's inputs. See the attached Schedule 9 for both sets of outcomes.

[49] As noted earlier in this testimony, capital cost factors flow into support assets factors, which flow into labor rates. One labor rate directly flows into LoopCAT, one directly flows into NID premises termination cost, and one flows into distribution terminal cost. Therefore, depreciation lives also flow into LoopCAT through (1) labor rate, (2) NID premises termination cost, and (3) distribution terminal cost.

It is worth noting, from Schedule 9 of this testimony, that Fill Factors and Cost of Capital Factors rank the highest in sensitivity analysis (in all rate zones). Staff's proposed modifications to Fill Factors *alone* would result in a reduction in SBC's proposed TELRIC by xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively. In other words, if we were to replace SBC's fill factors with Staff's fill factors, but leaving all other SBC's inputs unchanged, SBC's proposed TELRIC would decrease by xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively. Similarly, Staff's modifications to SBC's Cost of Capital Factors *alone* would result in a reduction in SBC's TELRIC by xx.xx%, xx.xx% and xx.xx% in zones 1-3, respectively.

In contrast, DLC-RT Common Factor and Sale Tax rank the lowest in sensitivity analysis in zone 1, with the respective reduction in TELRIC being x.xx% and x.xx%. In zones 2-3, Sale Tax ranks the lowest in sensitivity analysis and its impacts are x.xx% and x.xx%, respectively.

Q. Does this conclude your testimony?

A. Yes.